

STATINTL

MEMORANDUM

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TO:

FROM:

SUBJECT: Comments on "Specification of a Chip Printer"
7 July 1965 and Amendment 1, 15 October 1965

Comments on the spec of 7 July 1965 which appears to be the basic equipment requirement are as follows:

1.1 Description - Nothing mentioned about installation considerations like size, weight, etc. Who prepares installation sight? Who does installation? What defines when you take possession from vendor?

2.6.2 Output Rate - Does this paragraph mean that the sequential exposure rate (target to target) is to be 6/minute and the repetition rate 10/minute? If so, by stating the latter in terms of a design objective rather than a requirement a loophole is provided. If the interpretation of the 6/minute is correct, isn't the limitation really in the speed of film transport, average distance between targets, and the skill of the operator? On what requirements are these output rates based? *Guestimates.*

2.7 Transport System

2.7.3 Specifies X mensuration accuracy of 0.012 inch (0.3 mm) per 25 inches of travel. 2.7.4 Specifies positioning in Y direction to 0.1 mm. Isn't it positioning accuracy in both cases? Does this accuracy achieve anything? Unless this spec was based on an analysis of the error this tolerance introduces in measurement, it isn't much better than a guess. If overstated, you are paying handsomely for something not needed.

2.9 Specifies an adjustable X and Y mensuration system accurate to $\pm 1/2$ mm over 25 inches. How does this differ from 2.7.3 and 2.7.4 above? What does it mean? *Nothing.*

2.9.3, 2.9.4, and 2.9.5 Resolution. $6\sqrt{2}$ is not 12%. Why not just state the required resolution based on knowledge of the film, negative, etc. and leave out the buzz words?

*at the time of
rite-up
is out of it
I use MIL Specs. etc.
So, this is not
normally spelled
it on a
prototype.*

2.16 Reliability - What is meant by 90% duty cycle? If it means 90% up time, how is this to be demonstrated in a test? What constitutes "satisfactory and proper operation" for 10 hours? Wouldn't it be better to specify reliability in conventional terms of mean-time-between failures, the MIL specs and test for which are well established?

2.17 Service Life - How many years of operation are equivalent to 5000 hours? What constitutes degradation of performance? What is normal mortality? Is the service life reasonable with respect to cost? At 8 hours operation per day and 5 days/week, 5000 hours is 2 1/2 years. The cost per year of this equipment would appear to be quite high.

*For R&D
prototype??*

3.4 Acceptance Test - If the amount of operational use is unknown, shouldn't the acceptance period be specified in terms of operational hours? Some of the complex equipment around the building isn't used 10 hours in 30 days. What is a 30 day normal operational period under production conditions?

*Who knows?
this is an operational
function not yet
pelled out*

7. Manuals, is very sketchy. There is no mention of operational tests and check out to determine when maintenance is required? In no case yet have any of your vendors volunteered this to my knowledge. If it is intended that the contractor produce a useful operational and maintenance manual, at least the following need be specified:

- Valid.*
1. Description of equipment and operating components.
 2. Directions for operating equipment.
 - a. Pre-checks
 - b. Turning on
 - c. Adjusting
 - d. Routine operation
 - e. Indications of trouble
 - f. Shutting down

Maintenance manual should include at least:

1. Operations manual
2. Detailed component descriptions
 - a. Detailed parts list
 - b. Detailed spare parts list
3. Detailed maintenance procedures
 - a. Maintenance schedule
 - b. Operational tests and schedule
 - c. Trouble shooting procedures
4. Schematics and diagrams

9. Changes of Scope

In because the magazine only holds 36 is no reason to limit the # of prints. 2 or 6 magazines can be used.

9.17 Specifies 99 copies of a print. Is there any conceivable need for this number? The chip cassette only holds 36 anyway. Apparently the specification is really for a counter and has nothing to do with the number of chips which can be produced.

The following comments apply to Amendment 1 of 15 October 1965 which is apparently intended to set forth the vendors obligation for testing the instrument to demonstrate adherence to specs. There are serious shortcomings in these specs which should be altered if it is really evident that an instrument of this cost and complexity is needed.

Eng. is still form errors this.

3. Test Conditions - These appear to prescribe the conditions in the vendor's test area. Do they bear any relation to those where the equipment is to operate? If they don't the test is meaningless.

Refer to page 2

4.3.3 Resolution - It is assumed that the manufacturer's resolution refers to the film maker. $6/\sqrt{2}$ is not 12%. It is stated as $6\sqrt{2}$ in 2.9.3 of 7 July spec. Is it supposed to be $1/6\sqrt{2}$?

Value

4.3.4 Positioning Accuracy - If as discussed above, the specified accuracy is needed, the test described will not necessarily demonstrate it. A single test is not enough unless the error can be proven to be entirely linear. Otherwise, error such as that resulting from backlash could still occur in the first fraction of an inch and remain relatively constant thereafter. A better specification would be % error per unit travel.

What is used to measure "the exact dimensions given between the two cross hairs"? What is used to "check the resultant accuracy on the output film"? These measures are subject to error also.

Again - this is a prototype
4. Functional Tests - There seem to be some tests missing! Neither 2.7.9 (whatever it is) nor 2.6.2 Print Rate are to be tested. Nothing is mentioned in the specs or tests about transport speed or loading time (roll film and cassettes).

5. Reliability - Keeping a log of Q.C. testing is nice but does nothing to demonstrate reliability. Meeting a Q.C. requirement may have nothing to do with reliability. Print quality and illumination level, for example don't. In short, there is nothing stated which will demonstrate any reliability let alone 5000 hours without degradation of performance. It could fail every five minutes and you would have no recourse.

Remarks

- Ha!*
1. These specifications reflect insufficient effort in defining the problem and developing the concept of the solution. The requirements for speed of operation, print capacity, and positioning accuracy are not supported by any quantitative information. Before buying an item this expensive, a rigorous study should be made not only to derive performance characteristics but to evolve the operational concept. Piecemeal development of chip equipment is not likely to improve the efficiency of the exploitation system.
 2. There is no real reliability specification and no plan to demonstrate any reliability, good or bad. There is a large risk that this equipment will not perform dependably. There is ample evidence from past developments that operating personnel quickly lose interest in trying to use any equipment not reliable.

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